

International Polar Year 2007-2008

Observing System Legacy



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Purpose of the presentation

IPY provides a unique opportunity to convert valuable components of several observational projects, which were successfully developed and implemented during the period of IPY, into sustained long-term research and monitoring capabilities. The purpose of this presentation is to identify main important steps in the process of developing observing systems as part of IPY legacy and assess their importance in the context of global change problems as components of global observing systems. It is based on the outcomes of several workshops and other meetings as well as publications dedicated to major observing initiatives listed below.

IPY field phase (1)

- ❖ IPY projects on the continents were carried out in 2007 and their implementation is continued in 2008 in both Polar Regions, studying of atmospheric processes, polar oceans, glaciers and ice sheets, permafrost, hydrological cycle, the ecosystems, circumpolar human societies, etc.
- ❖ Studies of the polar atmosphere were intensified by the establishment of new Arctic international environmental observatory Tiksi (Russia, USA, Finland), by modernization of stations and/or equipment at several observing stations in the Arctic and Antarctica, by establishment of new manned station (Belgium) in Antarctica, and deployment of new AWS in the Arctic and Antarctica.

Atmospheric Arctic Observing Sites



Station Princess Elisabeth in Antarctica, 70S 23E

(Courtesy IPF, Belgium)



Neumayer station (Germany)



Halley IV station (UK)



A photograph of an Automatic Weather Station (AWS) installation in a snowy, inland Antarctic environment. The station consists of a tall, silver pole with various sensors and instruments at the top. Several people in winter gear are gathered around the base of the pole, some standing and some kneeling, appearing to be working on the equipment. The ground is covered in a thick layer of snow, and the sky is a clear, bright blue. The text "AWS Installation in Antarctic inland during IPY by CMA (Courtesy CMA)" is overlaid on the lower half of the image.

**AWS Installation in Antarctic
inland during IPY by CMA** *(Courtesy CMA)*

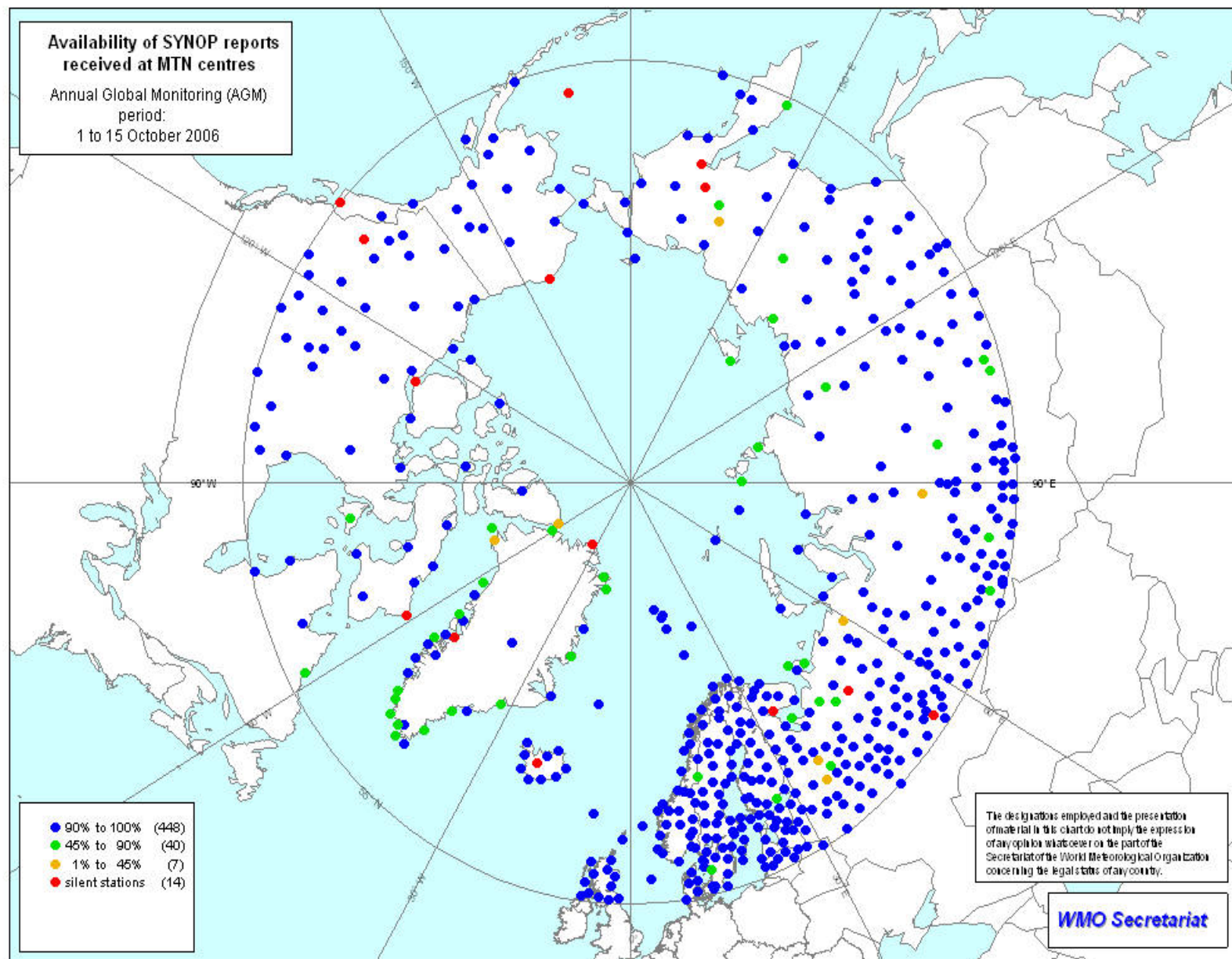
Increase of the number of reports

The successful start of IPY was resulted in an increase of the number of reports from traditional observational networks of atmosphere in Polar Regions. According to results of the WWW monitoring from 1 to 15 July 2007 (compared with the same period of 2006)

in the Arctic the number of synoptic stations transmitting 90-100% reports increased **by 8 stations** located on the coast and islands of the Euro-Asian sector,

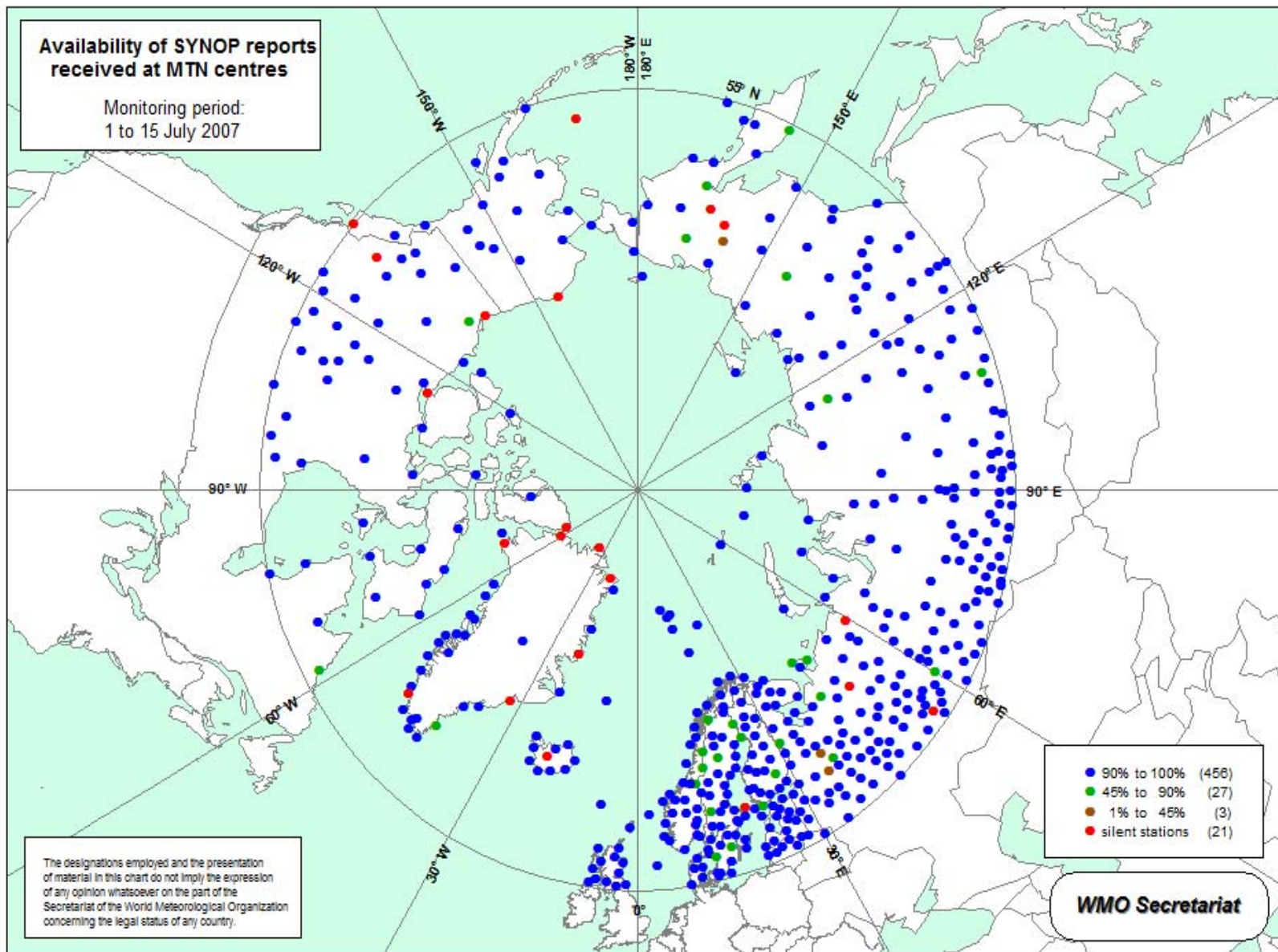
in Antarctica - **by 2 stations**,

AMDAR reports in the Arctic - **by 22 271**.



**Availability of SYNOP reports
received at MTN centres**

Monitoring period:
1 to 15 July 2007

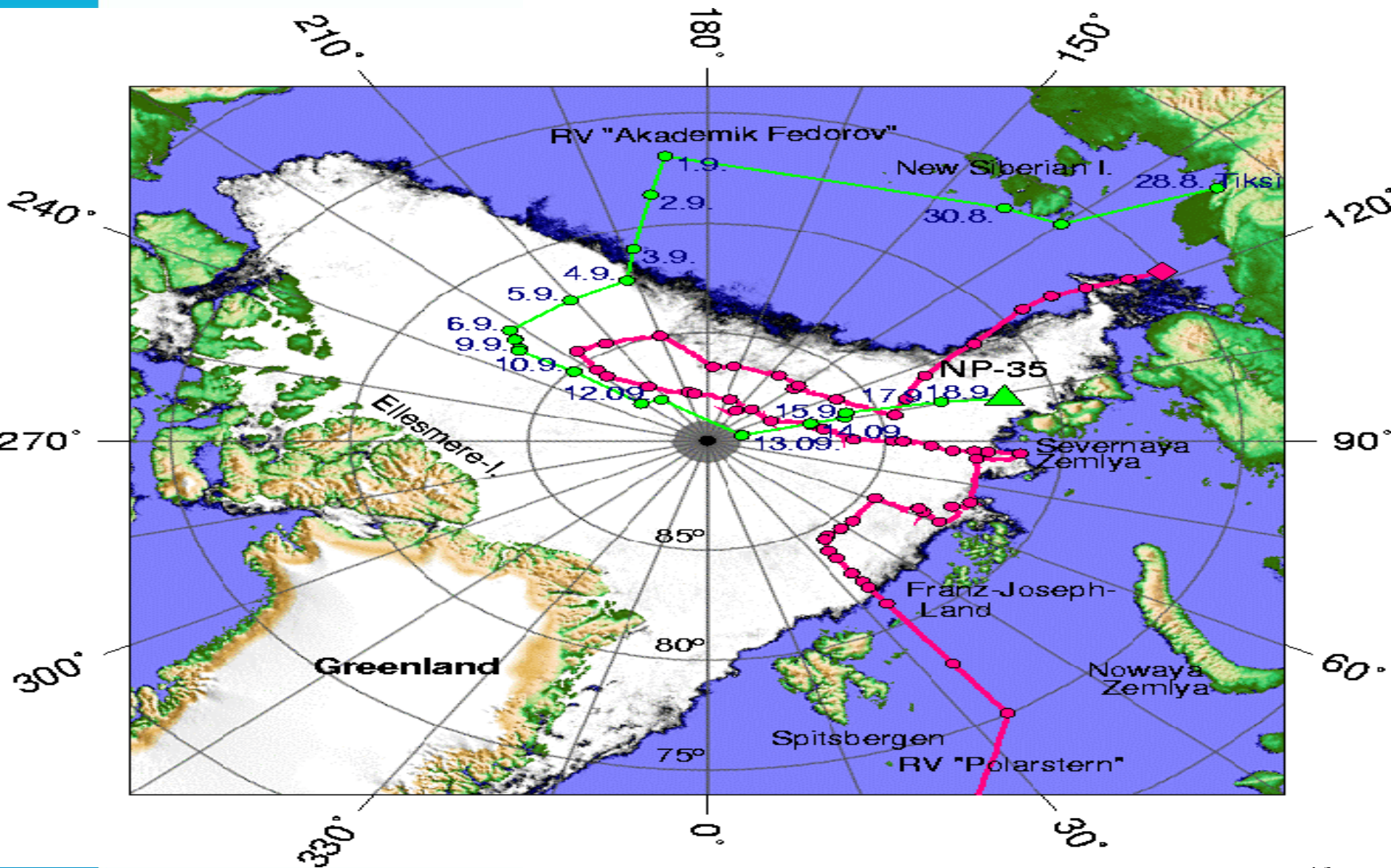


The designations employed and the presentation of material in this chart do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Meteorological Organization concerning the legal status of any country.

IPY field phase (2)

- International multidisciplinary marine expeditions were carried out in July - September 2007 in the Arctic Ocean, implementing of IPY projects related to studies of physical and chemical oceanic processes, sea-ice properties and changes, physical and chemical interaction between atmosphere, sea-ice and ocean, marine geology and biology.
- The deployment of 156 oceanographic moorings and arrays as well as new underwater and under-ice mobile observing facilities was done across the Arctic Ocean during 2007.
- IPY project “Climate of Antarctica and Southern Ocean (CASO)” (1stage) was carried out in the Antarctic in January- March 2008

Cruise tracks of F/S Polarstern and R/V Akademik Fedorov Fedorov in summer 2007 *(courtesy of R. Dickson)*

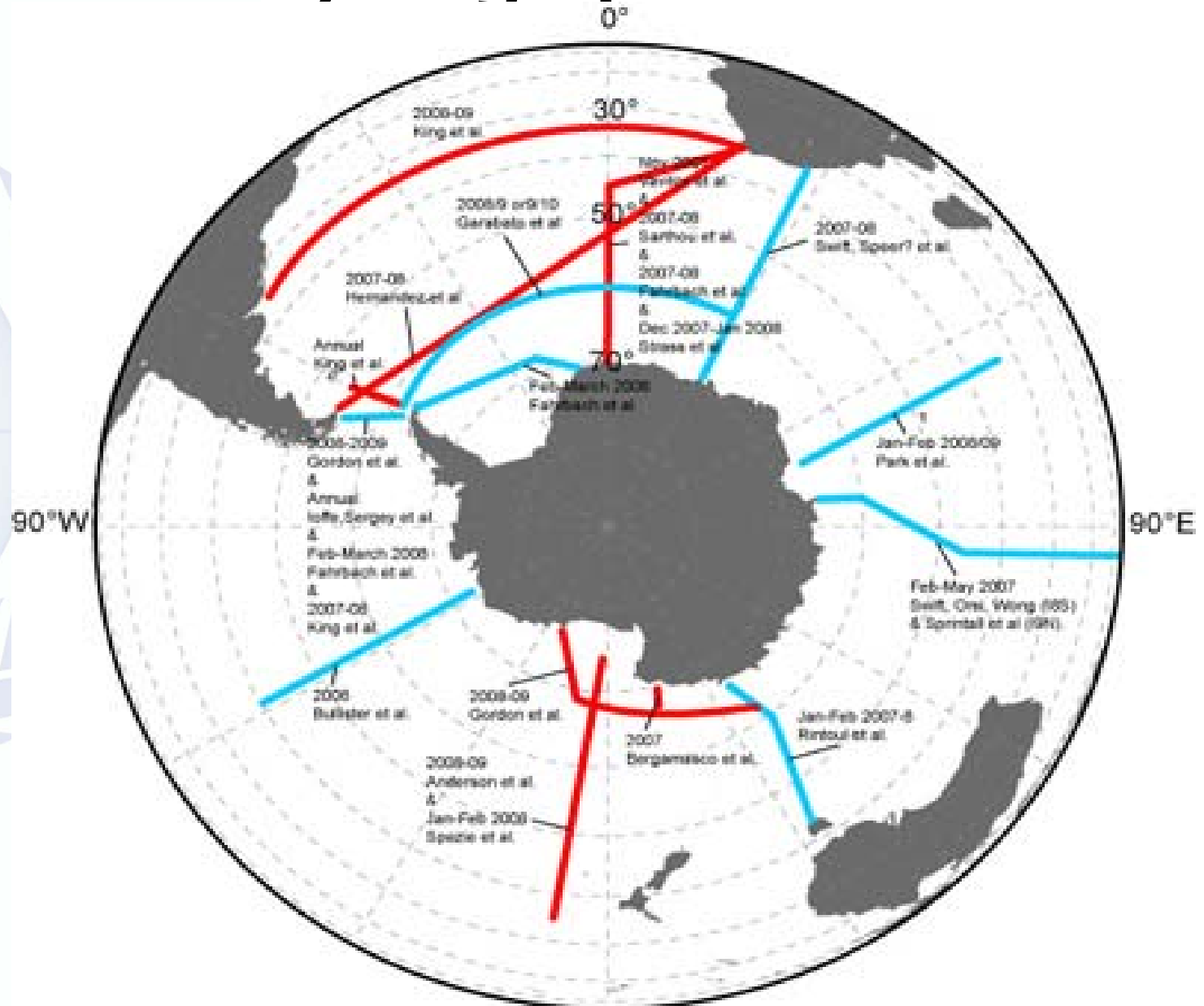


[illegible]

145 oceanographic moorings

Hudson Bay
Smooings (2005-2018)

CASO Hydrographic Sections



Increase of the number of reports (2)

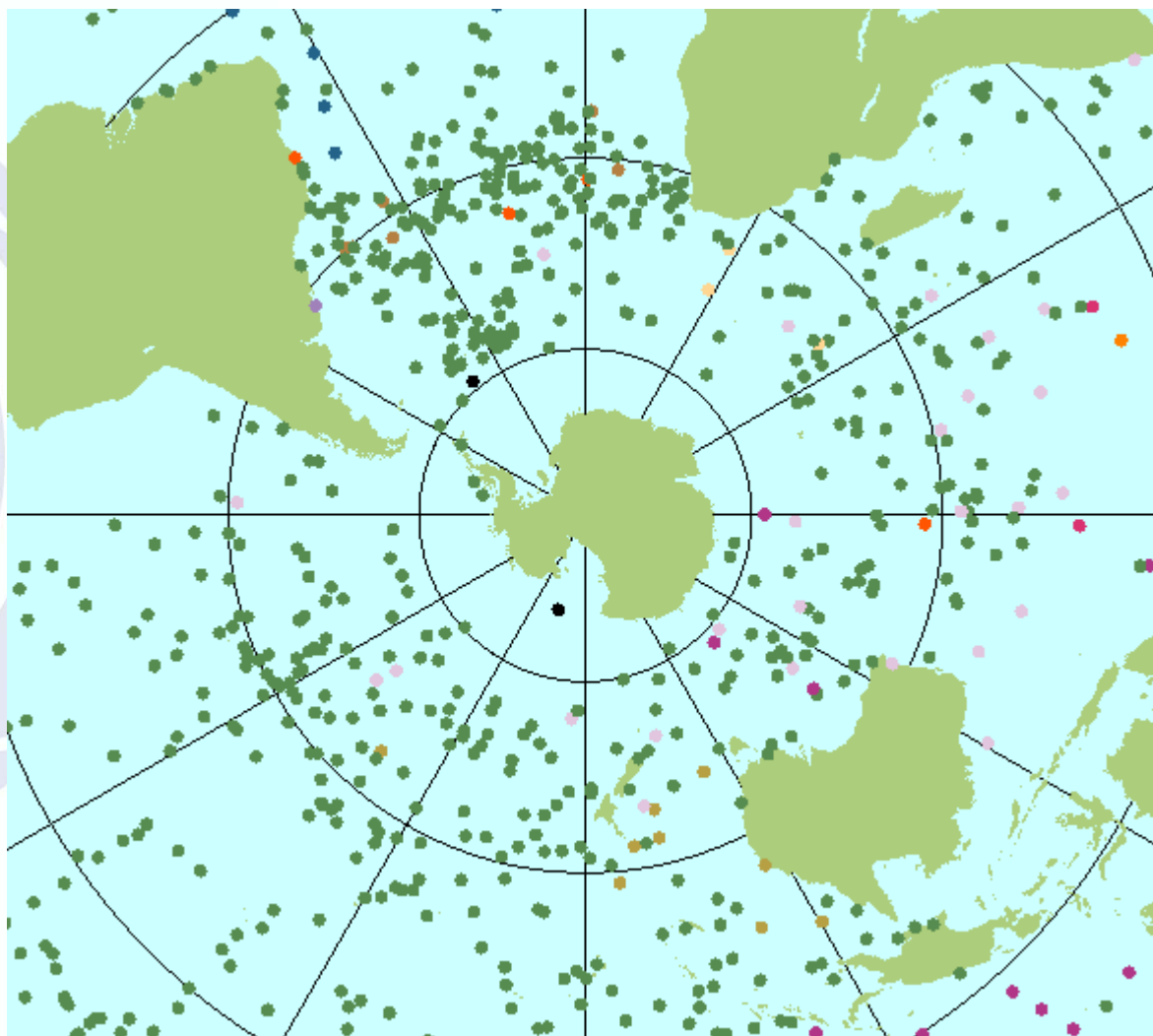
Increase of the number of reports from observational networks of oceans in Polar Regions according to results of the WWW monitoring from 1 to 15 July 2007 (compared with the same period of 2006) was as follows:

in the Arctic the number of BUOY reports has increased by **1096**,

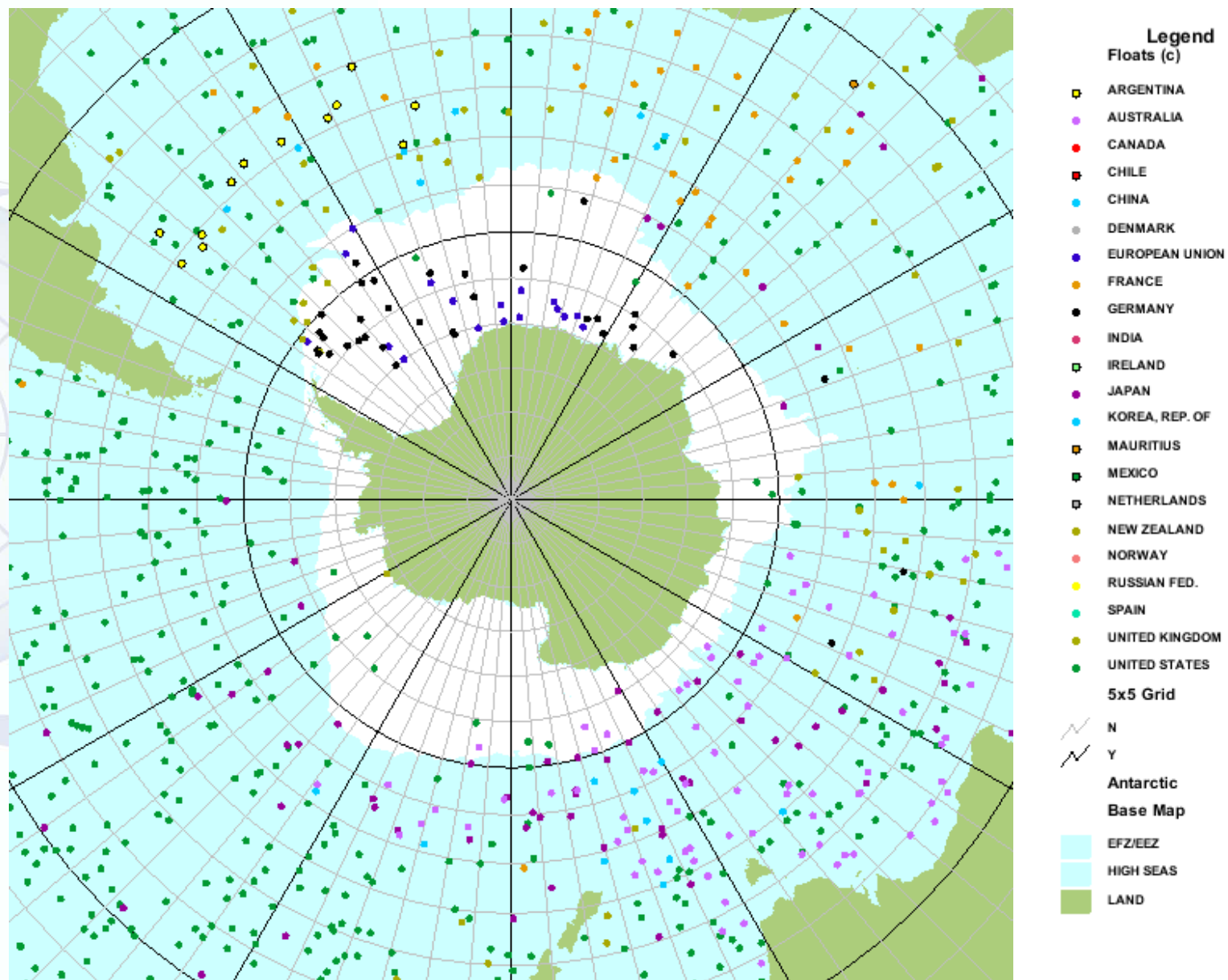
In the Antarctic the number of BUOY reports has increased by **18 150 (five times more)**,

the number of TESAC reports has increased by **39**,
in particular due to deployment of Argo floats at the Southern ocean.

Drifting buoys, August 2007



Argo, September 2007



IPY Space Activities

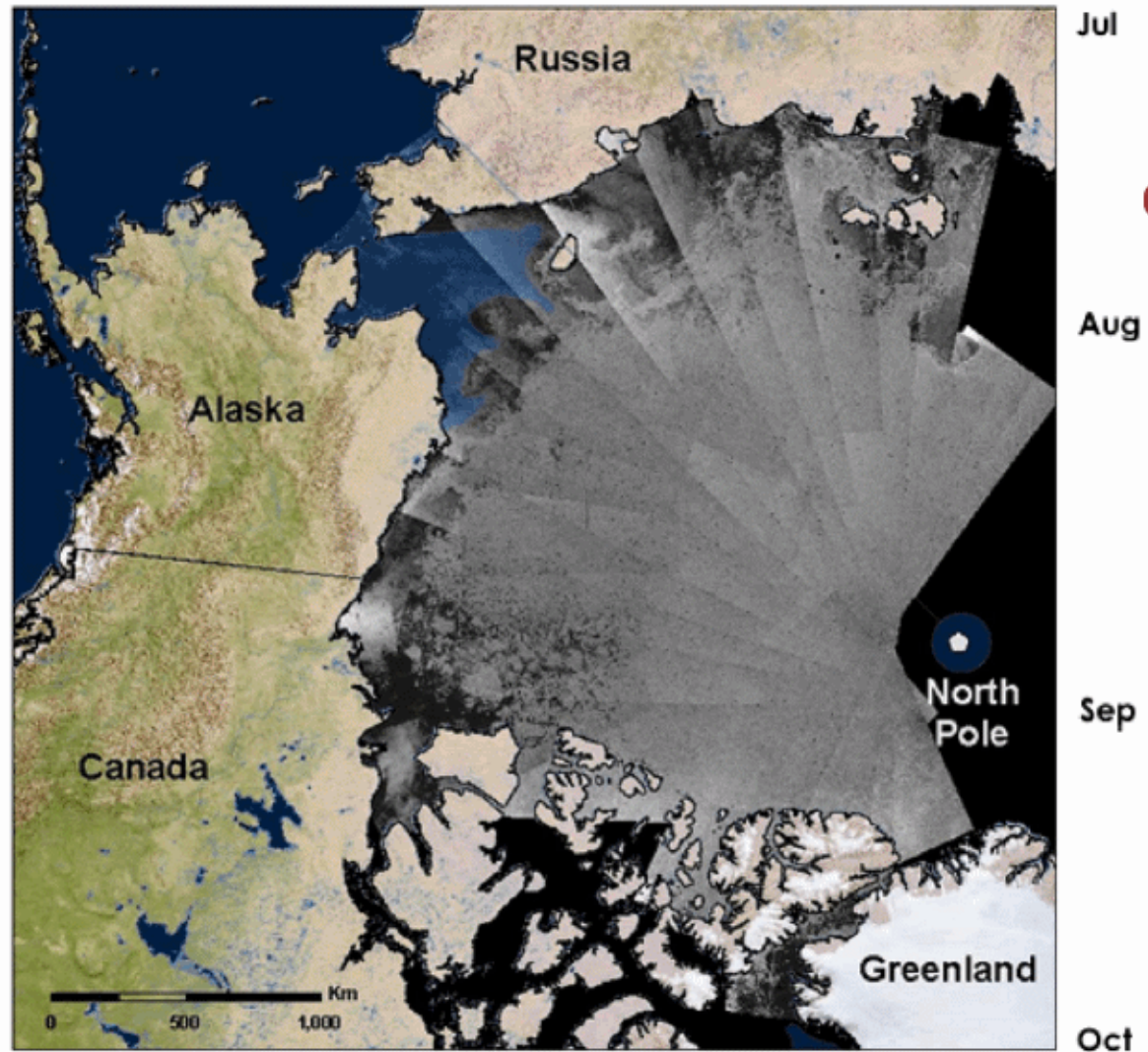
Significant progress was made by Space Agencies during the first year of IPY in response to acquiring comprehensive Arctic and Antarctic snapshots; panning, acquiring and archiving an impressive array of new data products to address some of the key scientific goals; and in building a space-borne component of the IPY data legacy.



2007 Arctic Sea Ice Extent Record Minimum Captured by CSA RADARSAT-1



The Alaska Satellite Facility (ASF) downlinks and mosaics Canadian Space Agency (CSA) RADARSAT-1 images of the western Arctic Ocean every three days. These synthetic aperture radar (SAR) images are acquired both day and night regardless of weather conditions. The data are used for research and operational monitoring of changes in sea ice cover. The animation to the right shows changing sea ice conditions from mid-July to mid-September and documents the evolution of a record minimum extent in 2007. The transparent blue mask indicates the sea ice edge as determined by analysts at the National Ice Center (NIC).

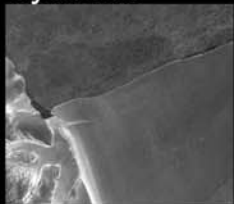


RADARSAT-1 SAR IMAGERY © CSA 2007



Antarctica Browse Mosaic (Cycle08, 14, 16)

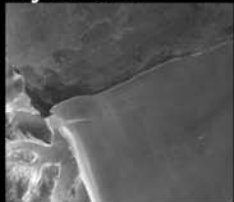
Cycle08



Cycle14



Cycle16



Cycle08:

2006/12/5~2007/1/19

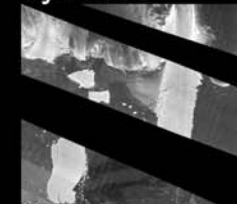
Cycle14:

2007/9/7~2007/10/22

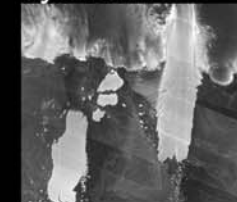
Cycle16:

2007/12/8~2008/1/22

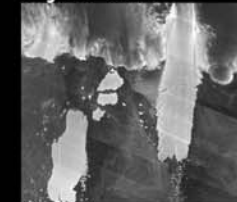
Cycle08



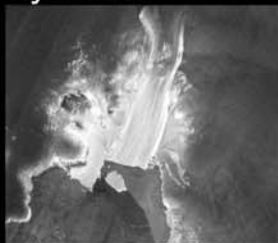
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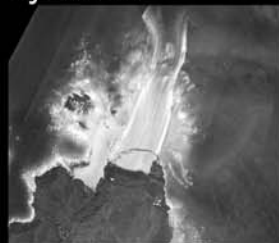
Cycle16



Cycle08



Cycle14



Cycle16



Cycle08



Cycle14



Cycle16



IPY legacy - major observing initiatives

- Sustaining Arctic Observing Networks (SAON),
- Integrated Arctic Ocean Observing System (iAOOS) as part of SAON,
- Pan-Antarctic Observing System (PAntOS),
- Southern Ocean Observing System (SOOS) as part of PAntOS,
- Global Cryosphere Watch (GCW),
- Establishing an IPY Satellite Data Legacy.

Sustaining Arctic Observing Networks

- Purpose: To develop a set of recommendations on how to achieve long-term Arctic-wide observing activities that will provide free, open and timely access to high quality data that make it possible to realize pan-Arctic and global value-added services with high societal benefits.

Future steps:

- St. Petersburg Workshop (July 2008) - active participation of leading Russian experts in Arctic observations relevant for SAON;
- Asian workshop (Republic of Korea, September 2008) - to entrain leading Asian experts in SAON development;
- Helsinki workshop (October 2008) to finalize recommendations for securing support to coordinate and sustain Arctic observing and data and information management activities over the long-term;
- Work on the iAOOS will be continued under SAON umbrella.

Pan-Antarctic Observing Network

Purpose: Provide recommendations to SCAR XXX for establishing an Expert Group on Development and Coordination of the Integrated Multidisciplinary Pan-Antarctic Observations Network which encompass the Antarctic Continent and surrounding Southern Ocean.

Future steps:

- To prepare a preliminary analysis of existing/planned observational networks with an initial assessment of where deficiencies or over-provision exist, and recommend protocols for assembling networks' data via a family of Virtual Antarctic Observatories;
- To organize a workshop to address the PAntOS objectives, to understand current and planned observational infrastructure of the Antarctic, and form a Task Force to work on PAntOS Report;
- To prepare a Plan for development of SOOS, a key component of the PAntOS, to provide integrated multidisciplinary observations in the Southern Ocean, which are necessary to understand key physical and biogeochemical processes in the Southern Ocean;
- Meeting in St. Petersburg (July, 2008) to review draft Plan for SOOS.

Global Cryosphere Watch

Purpose: Explore the possibility of creating a Global Cryosphere Watch as important contribution to the IPY legacy and to prepare recommendations for its development.

Future steps:

- To organize a WMO/GEO/WCRP Workshop “The IPY Legacy of Observing Systems: A Global Cryosphere Watch Initiative” (Geneva, December 2008) in order to identify relevant activities, review and prioritize IPY projects related to cryosphere, and potential sponsors per priority activity.
- To prepare a scoping document by the ad hoc group (Chair B. Goodison) established on request of WMO Cg XV to define the feasibility of developing and implementing a CGW as part of IPY legacy;
- To complete feasibility study by the ad hoc group in April 2009 to make decision by the WMO EC-LXI in June 2009.

Establishing an IPY Satellite Data Legacy Initiative

Purpose: To leave a legacy data set compiled from multiple space agency satellite data portfolios comprising a broad range of a “polar snapshot” products and propose a cooperation arrangement between major satellite agencies ensuring coordination of their polar observations beyond IPY.

Future steps:

- To continue the IPY Project GIIPSY (Global Interagency IPY Polar Snapshot Year) to build a space-borne component of the IPY data legacy, determine gaps that should be covered and identify proper actions and recommendations to this effect;
- To discuss the efforts to survey the IPY users and/or to engage scientists in projects to deliver higher level products from processed SAR and other satellite data and products (STG4, Geneva, February 2009).
- To coordinate international efforts in collecting of space-borne “snapshots” of the Polar Regions during the IPY and in establishing a preliminary structure for sustaining observations into future towards achieving a Polar Satellite Constellation .

Contribution of IPY observing system to the Global Observing Systems (1)

Purpose: To secure IPY observing systems legacy as contribution to development of WIGOS which is a component of GEOSS, leading to a reinforcement of existing global observing systems (GOS, GAW, WHYCOS, GOOS, GTOS) and promoting creation a new one (GCW) to cover observational gaps in Polar Regions and other areas of the globe.

Note: WIGOS (WMO Integrated Global Observing System) is a comprehensive, coordinated and sustainable system of observing systems (most of them are already implemented by WMO in cooperation with ICSU, IOC, UNEP), covering atmospheric, oceanic, terrestrial (including hydrological) and cryosphere domains and ensuring interoperability between its component systems.

Contribution of IPY observing system to the Global Observing Systems (2)

Method: To establish a partnership between the IPY legacy observing initiatives and WIGOS to reinforce existing global observing systems in the following domains :

- *Atmosphere* where the establishment of SAON and PAntOS as well as achieving a Polar Satellite Constellation will reinforce WWW/GOS, GAW , WHYCOS;
- *Ocean* where the establishment of iAOOS and SOOS would fill gaps in polar oceans observations carried out within GOOS;
- *Cryosphere* where the creation of a CGW including both *in-situ* and satellite observations, in particular achieving of a Polar Satellite Constellation would provide substantial input to further development of GOOS (sea ice observations), GTOS (hydrological cycle, permafrost, ice sheets, glaciers) and to GCOS as whole.

Proposed mechanisms (1)

In order to coordinate and guide this process:

1. WMO EC-LX (June, 2008) established the Panel of Experts on Polar Observations, Research and Services co-chaired by EC members D. Grimes (Canada) and J. Love (Australia) with the following terms of reference (among others):
 - to provide a high-level WMO partnership in the activities aimed to secure the IPY observing system legacy in close communication with operational agencies in Member countries and international organizations that have a great interest in Polar Regions;
 - to provide regular input on issues related to polar meteorology, hydrology and glaciology to the activities of relevant groups or bodies, such as the Joint Scientific Committee for WCRP, the International Arctic Science Committee, the Scientific Committee on Antarctic Research, the Council of Managers of National Antarctic Programmes, the Intergovernmental Oceanographic Commission of UNESCO, and WMO Technical Commissions;

Proposed mechanisms (2)

2. IASC and SCAR Executive Committees have recently established a Joint Bipolar Action Group to advise them on the development of instruments such as workshops, programs and networks to address bipolar issues (i.e. the first priority is to see how and where we could work, more closely together) and to advise the SCAR and IASC Executive Committees on the development of mechanisms to nurture the IPY 2007/2008 legacy, with a special focus on the roles of IASC and SCAR.

Proposed mechanisms (3)

Some other solutions may be proposed, however it is clear that any of proposed mechanisms should include representatives of ICSU and WMO as IPY sponsors, of IASC and SCAR as bodies responsible for scientific research in Polar Regions, as well as AC and ATCM as the most relevant organizations to take overall responsibility for the IPY legacy. It is evident that leading persons from the IPY legacy observing initiatives described above have to be included in composition of such mechanisms.

It is desirable that a meeting of leading experts involved in the guiding of IPY legacy be organized in 2009.

International Polar Decade as unique opportunity to secure IPY legacy

EC-LX (June 2008), noting that success of the first year IPY implementation, great investments of the governments to this international campaign and growing requirements of scientific and local communities in the period of drastic changes in Polar Regions environment motivate the nations to continue to sustain high-quality observations and research in this area for a more extended period of time, **recognized the unique opportunity for WMO in consultation with ICSU and other international organizations to consider launch of an International Polar Decade as long-term process of research and observations in Polar Regions to meet requirements climate change studies and prediction to benefit societal needs.**